Maryland Technical Architecture Framework
Baseline TRM

Version 1.1

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DEPARTMENT OF
BUDGET & MANAGEMENT

Record of Changes

Version	Date of Change	Pages Affected	Nature of Change	Author
1.0	4/1/05	All	Initial Publication	Thomas & Herbert Consulting LLC during Contract # F104200135
1.1	4/12/05	21	Merged asset management and desktop monitoring technology areas within the enterprise management domain. Changed version number and headers throughout document.	Thomas & Herbert Consulting LLC during Contract # F104200135

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SECTION 1 INTRODUCTION

1.1 Background

The State of Maryland, hereinafter referred to as "the State", has a critical need to collect, consolidate, and classify information about individual agency technology resources in order to support cross-agency standardization, analysis of duplicative investments, and identification of opportunities for collaboration within and across State agencies. The State's primary driving force at this time is to enable interoperability across platforms and services, while ensuring that technology is used cost-effectively to support the business of State government.

To fulfill this need, the State began an Enterprise Architecture (EA) Program by initiating a project to establish a Technical Architecture Framework for Maryland. This framework includes the design of a technical reference model to facilitate the orderly, structured classification of technology resources, standards, and best practices within the State using an automated software toolset.

The objectives of the project were to:

- Identify the State's business drivers
- Develop guiding principles for creating and maintaining the State's standards
- Design a Technical Reference Model (TRM) for the State
- Populate the TRM with the products and specifications being used by each agency
- Identify product and specification standards for the State
- Implement a web-based repository to house the architecture information gathered during the project

1.2 Purpose

The purpose of this document is to present the State's TRM. It also provides insight into the background, resources, and approach that influenced the design of the State's TRM and explains the benefits of having and using a TRM.

1.3 References

The following materials were used to design the TRM for the State.

- A Practical Guide to Federal Enterprise Architecture Chief Information Officer Council Version 1.0, February 2001
- Federal Enterprise Architecture Framework Version 1.1, September 1999
- The Federal Enterprise Architecture Program Management Office (FEAPMO) Technical Reference Model (TRM) Version 1.1, August 2003
- NASCIO Enterprise Architecture Development Tool-Kit v3.0, October 2004.

- US Department of Energy, Technical Reference Model:
  http://cio.doe.gov/ITReform/ArchitectureStandards/overview/doe_trm.htm

- State of Indiana Information Technology Oversight Commission (ITOC) Enterprise
  Architecture Documentation: http://www.in.gov/iot/architecture/

SECTION 2 WHAT IS A TECHNICAL REFERENCE MODEL?

A TRM is an enterprise reference model used to organize technology components. The Practical Guide to Federal Enterprise Architecture describes a TRM as a taxonomy that provides:

- A consistent set of service areas, interface categories, and relationships used to address interoperability and open-system issues

- Conceptual entities that establish a common vocabulary to better describe, compare, and contrast systems and components

- A basis (an aid) for the identification, comparison, and selection of existing and emerging standards and their relationships.

2.1   Federal Guidance

The Federal Enterprise Architecture Program Management Office (FEAPMO) was established in 2002 under the direction of the Associate Director for Information Technology (IT) and E-Government, Office of Management and Budget (OMB). It was established to manage and coordinate activities surrounding the development of the Federal Enterprise Architecture (FEA). FEAPMO developed a set of government-wide reference models that are used to define the FEA. These reference models are designed to facilitate cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration within and across federal agencies. One of the reference models they have supplied is the FEA TRM. The FEA TRM guides agencies in developing agency-level TRMs. The FEA TRM and agency-level TRMs are applied to identify opportunities for information technology consolidation and re-use.

The FEA TRM organizes technologies in the following four tiers:

- Service Areas – A technical tier that supports the secure construction, exchange, and delivery of business or service components. A grouping of the requirements of component based architectures within the Federal Government into functional areas.

- Service Category – A sub-tier of the Service Area to classify lower levels of technologies, standards, and specifications in respect to the business or technology function they serve.

- Service Standard - The hardware, software, or specifications that are widely used and accepted (de facto), or are sanctioned by a standards organization (de jure).

- Service Specification – A formal layout/blueprint/design of an application development model for developing distributed component-based architectures.

The FEA TRM taxonomy is centered on the concept of a service oriented or component based architecture. The model is pre-populated with a significant amount of data detailing each element of its hierarchy and the associated guidance includes helpful information including usage and maintenance.

The FEA TRM is widely available and can be downloaded at www.feapmo.gov. Its structure is available in XML and contains a number of valuable service specifications that were used as the foundation for the State's TRM. Although the State is not required to follow this federal

guidance, the FEA TRM was referenced in anticipation of state/federal interoperability requirements.

2.2   NASCIO Guidance

Similar to the federal government, state and local governments continually face mandates for inter-agency/inter-state system interoperability. The National Association of State Chief Information Officers (NASCIO) supplies an Enterprise Architecture Development Toolkit that defines an EA framework for developing solutions that operate across agencies and within the lines of business of state and local governments. The toolkit includes a technology architecture framework that is comprised of a set of structured processes and templates to support implementation and communication of a technology architecture. The framework is a comprehensive guide for documenting the enterprise's current, emerging, and retiring technologies. It advocates classifying technology products as:

- Emerging – New technology that has the potential to become current.

- Current – Recommended technology that meets the requirements of the enterprise architecture.

- Twilight – Items that do not conform to the technology drivers and/or business drivers.

- Sunset – Items that do not conform to the technology drivers and/or business drivers and have a set discontinuation date.

Similar to the FEA TRM, the NASCIO technical architecture framework assists in organizing technologies. Unlike the FEA TRM the NASCIO technical architecture framework organizes the technologies in the following five blueprints:

- Domain – A category for the high-level logical groupings of functional or topical operations.

- Discipline – Logical functional areas to address when building the architecture blueprint.

- Technology Area – Technical topics that support the technology functional areas of the architecture blueprint.

- Product Components – Components include the protocols, products (families) and configurations that are specific to a technology area.

- Compliance Component – Designation of the guidelines, standards and legislative mandates associated with a Discipline, Technology Areas, and/or Product Components as appropriate.

2.3   FEAPMO and NASCIO Differences

Although the purpose of both organizations' technical architecture models is to organize technologies used to develop IT solutions, there are three main differences between the FEAPMO's and NASCIO's technical architecture guidance. They are: 1) terminology, 2) product collection and 3) product compliance/specification classification.

FEAPMO defines the technology architecture with a reference model comprised of **tiers** and NASCIO prescribes it as a framework comprised of architecture **blueprints**. Figure 1 depicts the correlation between the different terms.

Figure 1: FEAPMO VS NASCIO Terminology Correlation

FEAPMO TIERS	NASCIO BLUEPRINTS
Service Area	Domain
Service Category	Discipline
Service Standard	Technology Area
Service Specification	Product Component
	Compliance Component
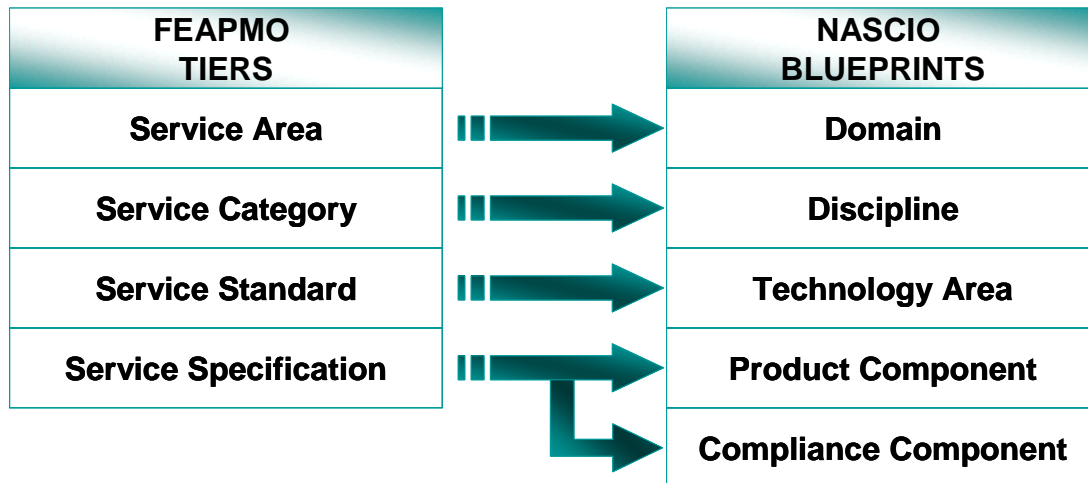
It is reasonable to forecast that these variances in terminology will be overcome in the near future, as version 3.0 of the NASCIO toolkit referenced developing a partnership with the Federal CIO Council.

The FEAPMO guidance does not prescribe the collection and classification of products. In fact, it specifically states that the TRM is not intended to provide or endorse particular vendor products. The products that do appear in the FEA TRM are sanctioned by the CIO Council and only pertain to developing web solutions. These products are collected in the service specification tier of the TRM. The NASCIO guidance not only includes the collection of products, but also suggests classifying the products as emerging, current, twilight, or sunset. In addition, the NASCIO guidance also suggests classifying the compliance components as emerging, current, twilight, or sunset. There is no mention of classifying the service specification items in the FEA TRM.

SECTION 3   BENEFITS OF THE TECHNICAL REFERENCE MODEL

It is anticipated that the TRM will become a useful tool for the State, providing information at both the agency and statewide level. Some of the benefits that agencies will begin to realize are information sharing, collaboration, simplification of procurements, strategic planning, and standardization.

3.1   Information Sharing and Collaboration

Product and specification data can be viewed for each agency. Each agency will also be able to view the products and specifications that other agencies are using. This provides the opportunity for agencies to share the lessons they learned about the products and specifications. For example, if an agency is considering using a product that another agency is currently using, they can contact that agency to obtain additional information regarding the product. It will help agencies determine interoperability requirements or may identify opportunities to share resources.

3.2   Simplification of Procurements

Agencies can also use the TRM to view the current standard specifications and products for each technology area within the TRM. These specifications can be used by agencies to help determine future product investments. The specification information can be included in Requests for Proposals (RFPs) to ensure compliance with the future direction of the State and accelerate the procurement process.

3.3   Strategic Planning

Another benefit of having all of the Technology data combined in one place and in a structured format is that the data can be viewed on a statewide level for strategic planning. For example, the TRM can be used to determine opportunities for statewide licenses. Products that are being used by many agencies are good candidates. The TRM may also be used to revise and realign the existing statewide contracts. These contracts should include the products that are classified as the current standard in the TRM. The TRM information can also provide the State with direction pertaining to skill-sets their human resources require. By viewing the set of products being utilized, resources can be developed and focused in the heavily used product areas. Having this information could assist in the development of statewide training programs for commonly used products, for example. The TRM should be a living document that assists the State in technology planning.

3.4   Standardization

Lastly the TRM can be used by individual agencies or on a statewide basis to assess alignment with products and specifications that have been classified as the current standard for the State. An assessment of each technology area's products and specifications can be conducted to determine if the State is properly diversified or overly diversified. This can lead to the addition of or planned removal of products and specifications.

SECTION 4   MARYLAND'S TECHNICAL REFERENCE MODEL

Although the FEAPMO term, TRM, was chosen for the name of the artifact that contains the products and specifications for the State, the structure is more in alignment with the NASCIO guidance. Because the primary goal of the State's TRM is to enable informed decision making based on relevant technical information, the State's TRM focuses on organizing and classifying technology products and specifications.

Figure 2: State of Maryland TRM Components
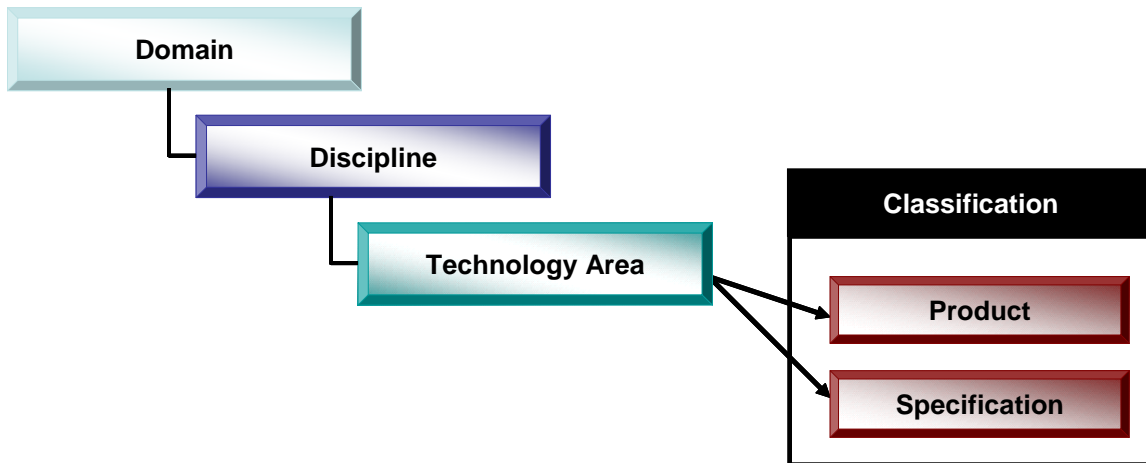
The following is a description of the components adopted for the State's TRM:

- Domain – The highest level category used to group related technology topics.

- Discipline – A sub-tier of the domain used to further define technology topics.

- Technology Area – Technology functional areas within the discipline used to group vendor products.

- Product – IT software and hardware that is distributed by a vendor and is specific to a technology area (i.e. Microsoft Exchange Server, Internet Explorer, etc…).

- Specification – Formal technical definitions that are widely used and accepted or sanctioned by a standards organization (i.e. HTTP, TCP/IP, etc…).

- Classification – A designation of the standard for a product/specification in the State (i.e. emerging, current, twilight, sunset, special use).

The NASCIO technical architecture framework and the FEA TRM were leveraged to accelerate the development of the State's TRM. Product and specification content were utilized from the FEA TRM and templates and processes from the NASCIO technology architecture framework were employed to gather, collect, and define information needed to populate the State's TRM.

The following sections contain the domains, disciplines and technology areas that comprise the State's TRM version 1.0.

4.1 User Access Domain

The user access domain is comprised of the products and specifications that support internal/external consumer access, delivery and interaction with the State. This includes all relevant forms of access such as remote, wireless, wired, disabled/impaired.

Figure 3: TRM User Access Domain
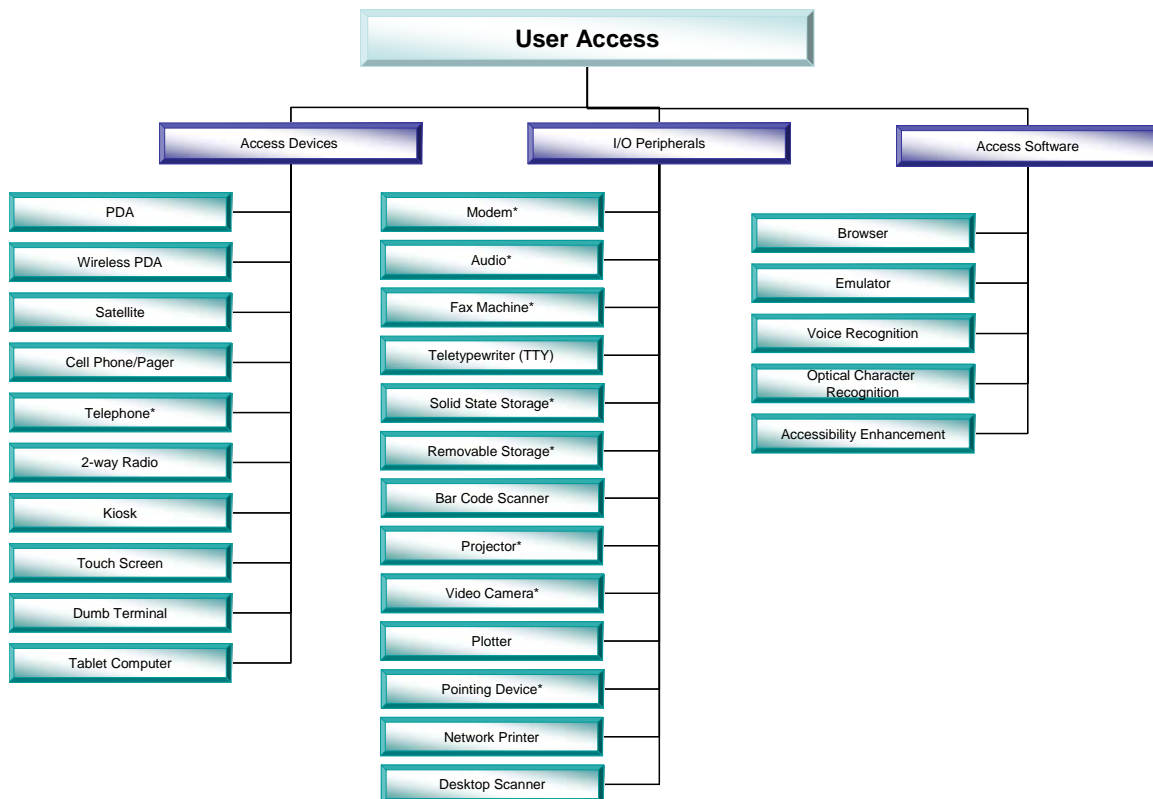
* Technology areas that will not be populated in the repository as the return on investment is low.

4.1.1 Access Devices

Tools used to interface between an application and its users.

PDA - Any computing device, without wireless connectivity, that is small enough to fit in the user's hand.

Wireless PDA - Wireless PDA (personal digital assistant) are small mobile hand-held device that provides computing and information storage and retrieval capabilities transmitting data via infrared line of sight, cellular, microwave, satellite, packet radio and spread spectrum.

Satellite - Devices that make use of man-made spacecraft that orbit earth, facilitating long-distance communication of voice, data and video. Examples of satellite devices include: satellite dish, satellite phones, GPS receiver, GPS tracker, or PCI satellite receiver adapter.

Cell Phone/Pager - A type of short-wave analog or digital telecommunication in which a subscriber has a wireless connection from a mobile telephone to a relatively nearby transmitter.

A pager is a small telecommunications device that transmits or receives alert signals or short messages.

Telephone - Used to communicate by voice with other people, the telephone is a device that converts sound into electrical signals [that can be transmitted over distances] and also converts received signals back into sounds

2-way Radio - A battery-powered portable that transmits messages via radio waves.

Kiosks - Publicly accessible computers in a strong housing that provide a user interface (i.e. touch screen) designed for point of sales, voting, or location specific directories.

Touch Screen - A computer display screen that receives input through human touch.

Dumb Terminal - Looks like a PC but only has a CRT screen and keyboard that cannot do any processing or storage of data.

Tablet Computer - A wireless personal computer (PC) that allows a user to take notes using natural handwriting with a stylus or digital pen on a touch screen. A tablet PC is similar in size and thickness to a yellow paper notepad and is intended to function as the user's primary personal computer as well as a note-taking device.

4.1.2   I/O Peripherals

External or internal computer devices that are not part of the essential computer (i.e. the memory and microprocessor).

Modem - Technology that modulates outgoing digital signals from a computer or other digital device to analog signals for a conventional copper twisted pair telephone line and demodulates the incoming analog signal and converts it to a digital signal for the digital device.

Audio - Technology that provides audio, the sound within the acoustic range available to humans. Sound is a sequence of naturally analog signals that are converted to digital signals by an audio card, using a microchip called an analog-to-digital converter (ADC). When sound is played, the digital signals are sent to the speakers where they are converted back to analog signals that generate varied sound.

Fax Machine - Technology that provides telephonic transmission of scanned-in printed material (text or images), usually to a telephone number associated with a printer or other output device.

Teletypewriter (TTY) - Telephone capable of sending text over phone lines

Solid State Storage – Nonvolatile, removable storage medium that employs integrated circuits rather than magnetic or optical media. This technology contains no mechanical parts. As a result, data transfer to and from solid-state storage media takes place at a much higher speed than is possible with electromechanical disk drives. The absence of moving parts may translate into longer operating life, provided the devices are reasonably cared for and are not exposed to electrostatic discharge.

Removable Storage – A storage device that is compact and portable.

Bar Code Scanner - A barcode reader, also called a price scanner or point-of-sale (POS) scanner, is a hand-held or stationary input device used to capture and read information contained

in a bar-code. A barcode reader consists of a scanner, a decoder (either built-in or external), and a cable used to connect the reader with a computer.

Projector - Specialized computer display technology that projects an enlarged image on a screen.

Video Camera - Records and plays visual images and sounds made on magnetic tape. A video camera captures light on chips, converts the light into electronic impulses using a charge-coupled device (CCD), and then fixes the electronic impulses onto tape.

Plotter - Pen, electrostatic, thermal or ink-jet device for making hard copies of text, graphics, maps on various media such as paper, vellum or mylar in up to 8,049 colors. May be drum or flat-bed, digital or analog.

Network Printer - A device, located on the LAN/WAN/MAN that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper.

Desktop Scanner - Technology that captures images from documents, photographic prints, posters, magazine pages, and similar sources for computer editing and display.

4.1.3   Access Software

Software that allows the ability to get access to a computer or a network.

Browser - A client based software program that reads HTML files and converts the information to what you see on the screen. It allows a user to find, view, hear, and interact with material on the Internet/Intranet. Browsers can also be text-based, but most include text and graphics.

Emulator - An emulator is a hardware device or a program that pretends to be another particular device or program that other components expect to interact with. Typically an emulator is provided when a popular hardware device becomes outdated but legacy applications exist that still need to communicate with the older device.

Voice Recognition - The technology by which sounds, words or phrases spoken by humans are converted into electrical signals, and these signals are transformed into coding patterns that can be identified by a computer. Based on this identification, the computer usually takes some action.

Optical Character Recognition - Optical Character Recognition is the recognition of printed or written text characters by a computer. This involves photo scanning of the text character-by-character, analysis of the scanned-in image, and translation of the character image into character codes, such as ASCII.

Accessibility Enhancement - Technology that assists organizations in identifying usability barriers faced by people with disabilities when accessing IT systems. Enhancements may include screen readers for people who are severely visually impaired or blind, screen magnifiers for people with low vision, on-screen keyboards and speech-recognition (dictation) software for people with limited dexterity, and/or keyboard enhancement utilities for people who have difficulty with standard keyboards.

4.2   Network Domain

The network domain contains the facilities for connecting, transferring, and exchanging information between multiple technical components. It also categorizes physical media, temporary and permanent connection types, transport mechanisms and network services.

Figure 4: TRM Network Domain
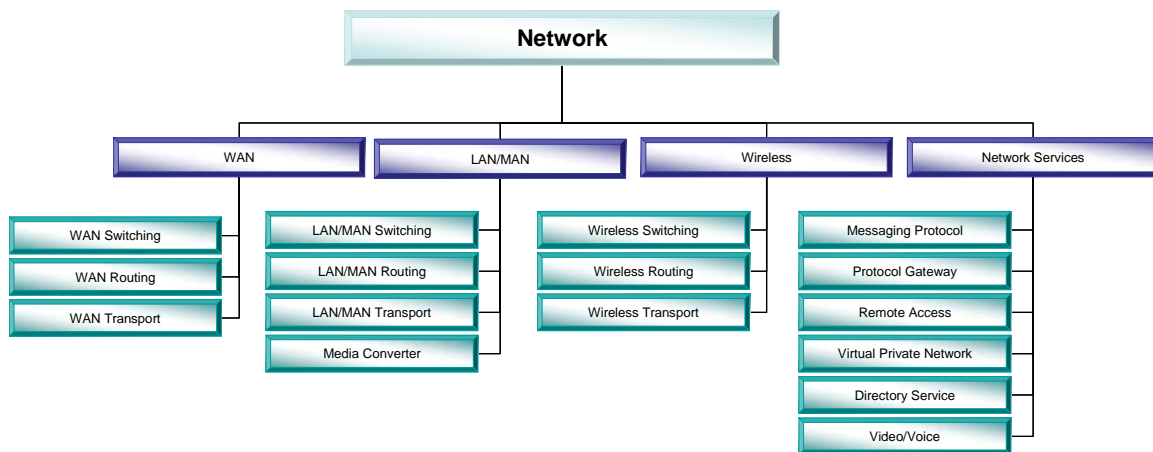
4.2.1   Wide Area Network (WAN)

Technology associated with extending a local area network (LAN) outside a building or beyond a campus. A WAN is typically created by using bridges or routers to connect geographically separated LANs.

WAN Switching - Multiport internetworking technology used in carrier networks. This technology typically switches such traffic as Frame Relay, X.25, and Switched Multimegabit Data Service (SMDS), and operates at layer 2 of the OSI reference model.

WAN Routing - Technology that moves information from a source to a destination. This technology directs network traffic at the Layer 3 (the network layer) of the OSI model of networks across a relatively broad geographic area and that often uses transmission facilities provided by common carriers, such as telephone companies.

WAN Transport - Technology responsible for ensuring data are delivered error-free and in the proper sequence in a wide area network.

4.2.2   Local Area Network/Metropolitan Area Network (LAN/MAN)

A group of computers and associated devices that share a common communications line or wireless link and typically share the resources of a single processor or server within a small geographic area (for example, within an office building or metropolitan area).

LAN/MAN Switching - Technology used to interconnect multiple network segments that cover a relatively small geographic area. This technology provides dedicated, collision-free communication between network devices, with support for multiple simultaneous conversations.

LAN/MAN Routing - Technology that moves information across an inter-network from a source to a destination. This technology distributes network traffic at the Layer 3 (the network layer) of the OSI model of networks that cover a relatively small geographic area and is typically used to connect workstations, personal computers, printers, servers, and other devices.

LAN/MAN Transport - Technology responsible for ensuring data is delivered error-free and in the proper sequence in a local area network/metropolitan area network.

Media Converter - Technology used to transition different media types from one to another, most commonly from fiber to copper.

4.2.3 Wireless

Technologies that use transmission via the airwaves.

Wireless Switching - Technology used to interconnect multiple network segments within the radio frequency spectrum.

Wireless Routing - Technology that moves information (utilizing radio frequencies) across an inter-network from a source to a destination.

Wireless Transport - Protocols responsible for ensuring data is delivered error-free and in the proper sequence in a wireless network.

4.2.4 Network Services

Protocols that define the format and structure of data and information that is either accessed from a directory or exchanged through communications.

Messaging Protocol - A special set of rules that end points in a telecommunication connection used to send and retrieve e-mail messages via the network.

Protocol Gateway - Technology used to restrict access to services, or specific functions within services, across a firewall boundary.

Remote Access - The ability to access a computer from outside a building or LAN in which it is located. Remote access requires communications hardware, software, and actual physical links, although this can be as simple as common carrier (telephone) lines or as complex as Telnet login to another computer across the Internet.

Virtual Private Network (VPN) - Technology used to provide remote offices or individual users with secure access to their organization's network. A virtual private network can be contrasted with an expensive system of owned or leased lines that can only be used by one organization. The goal of a VPN is to provide the organization with the same capabilities, but at a much lower cost.

Directory Service - Technology used for managing access to computer resources and keeping track of the users of a network, such as a company's intranet, from a single point of administration.

Video/Voice - Technology that supports the transmission of images and audio over the network.

4.3   Integration Domain

The integration domain contains discovery, interaction and communication technologies that join disparate systems and information producers and consumers.

Figure 5: TRM Integration Domain
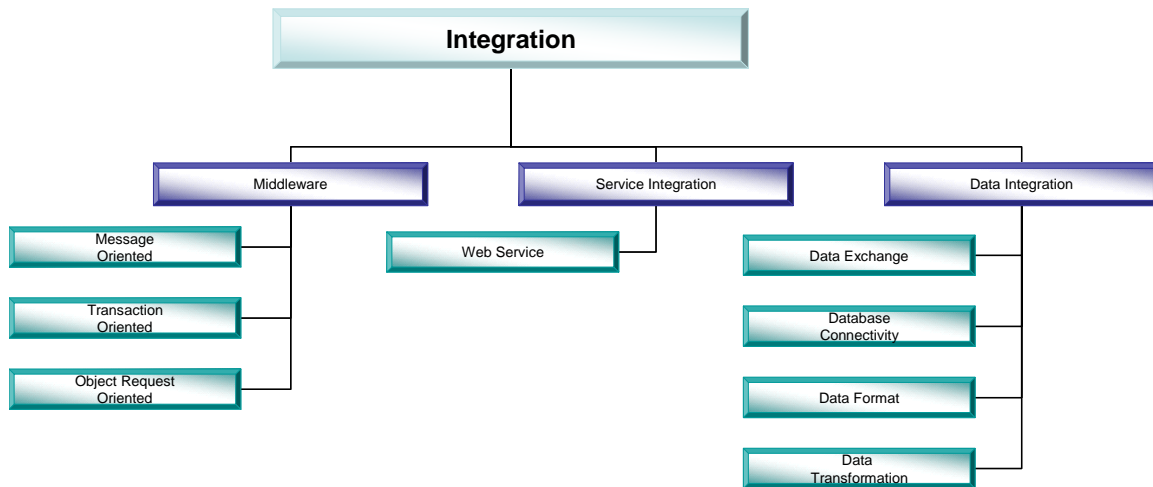
4.3.1   Middleware

Increases the flexibility, interoperability, and portability of existing infrastructure by linking or "gluing" two otherwise separate applications.

Message Oriented - Technology that provides an interface between applications, allowing them to send data back and forth to each other asynchronously.

Transaction Oriented - Technology that aims to interconnect heterogeneous database systems. It supports the processing of distributed transactions across platforms, offers high performance and availability, and ensures data integrity.

Object Request Oriented - Technology that mediates between an application program and a network by passing method invocation requests to the correct objects and returning the results to the caller. It is used to manage interactions between disparate applications across heterogeneous computing platforms.

4.3.2   Service Integration

Technology that supports the integration of computing entities using service interactions. These technologies address problems with integrating legacy and inflexible heterogeneous systems by enabling IT organizations to offer the functionality locked in existing applications as reusable services.

Web Service - Technology designed to support interoperable machine-to-machine interaction over a network. Web services describe a standardized way of integrating Web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone.

4.3.3   Data Integration

Technology that supports the consolidation and management of data from multiple sources.

Data Exchange - Technology that is used in the sending of data from one application to another. Data Exchange provides the communications common denominator between disparate systems.

Database Connectivity - Technology that provides connection between an application and a data store or database.

Data Format - A common structure to represent data so that the data can be exchange between disparate systems.

Data Transformation - Technology used to change data from one form or domain value set to another to improve its value and usability.

4.4   Infrastructure Domain

The infrastructure domain contains the underlying platforms, software, and hardware necessary to run applications and services.

Figure 6: TRM Infrastructure Domain
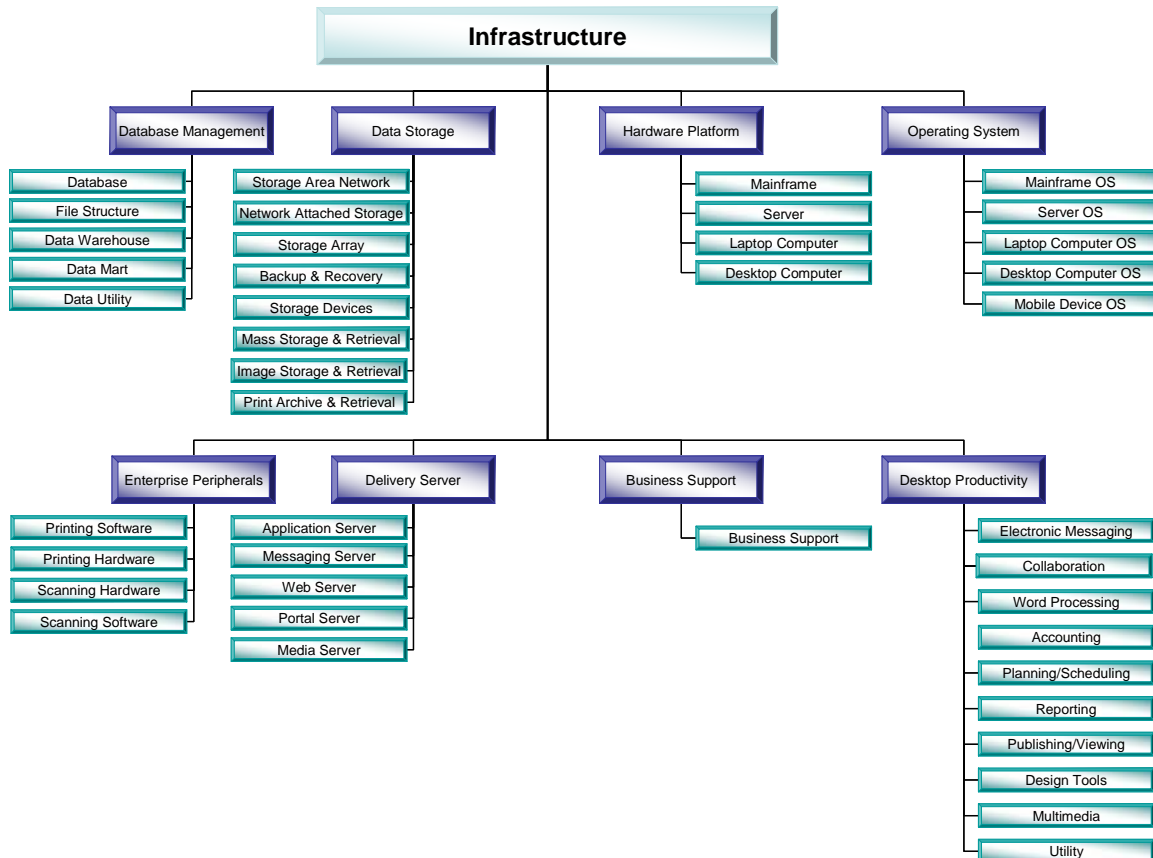
4.4.1   Database Management

Technology that supports the storage and administration of data.

Database - Technology used to create and maintain a collection of data organized to service applications and enable individual business applications to extract data they need without having to create separate files or data definitions in their computer programs.

Data Warehouse - Technology that manages the collection of data across the enterprise, designed to support management decision making.

Data Mart - Technology that manages a database, or collection of databases, designed to help managers make strategic decisions about their business. Data marts are usually smaller than a data warehouse and focuses on a particular subject or department.

File Structure - One of the first file management systems responsible for maintaining file indices and allowing records to be accessed either sequentially (in the order they were entered) or randomly (with an index).

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Data Utility - Technology that performs a specific task(s) to support the management of databases.

4.4.2   Data Storage

Refers to a collection of programs that enables storage, modification, and extraction of information from a database, and various techniques and devices for storing large amounts of data.

Storage Area Network (SAN) - Technology that provides a high-speed special purpose network (or sub network) that interconnects different kinds of data storage devices with associated data-servers on behalf of a larger network of users. Usually SAN technology is part of the overall network of computing resources for an enterprise.

Network Attached Storage (NAS) - Hard disk storage technology that is attached to a local area network (typically, an Ethernet network) and assigned an IP address.

Storage Array - Technologies that are designed to extend existing storage capability of hardware devices by providing arrangement of multiple harddisks.

Backup & Recovery - Technology that manages the creation and restoration of secondary copies of data in the event the primary data is unintentionally altered for some reason.

Storage Devices - Technology that is used to store data (e.g. tape drives, disk drives, CD ROM, etc…).

Mass Storage and Retrieval - Hardware that facilitates the storage and retrieval of data storage devices.

Image Storage and Retrieval - Technology that facilitates the storage and retrieval of images that have been generated through scanning.

Print Archive & Retrieval - Technology used for storing and restoring print jobs (generated by a computer) that may or may not be printed in the future.

4.4.3   Enterprise Peripherals

Technology used across an organization that is not part of an essential computer (i.e. the memory and microprocessor). Enterprise Peripheral devices can be both external and internal.

Printing Software - Software used for large volume print jobs. This technology is capable of producing communications such as manuals, directories and reports with speed, accuracy, and minimal operator intervention.

Printing Hardware - Device used for large volume print jobs. This technology is capable of producing communications such as manuals, directories and reports with speed, accuracy, and minimal operator intervention.

Scanning Hardware - Device that captures large volumes of images from paper documents, photographic prints, posters, and similar sources for computer editing and display.

Scanning Software - Software that is used to capture large volumes of images from paper documents, photographic prints, posters, and similar sources for computer editing and display.

4.4.4   Delivery Server

Front-end platform that provides information to a requesting application. It includes the hardware, operating system, server software, and networking protocols.

Application Server - Technology container that provides an integrated suite of distributing computing capabilities (i.e. resource management, transaction and security support, etc...) that are leveraged by business applications.

Messaging Server - Server-side technology that facilitates the exchange of computer-stored messages by telecommunication.

Web Server - A Web server is software application that uses the Hypertext Transfer Protocol. A Web Server is usually run on a computer that is connected to the Internet. A Web server may host or provide access to content and responds to requests received from Web browsers. Every Web Server has an IP address and usually a domain name (e.g. www.acme.com).

Portal Server - Service that offers a single-point of access to a broad array of resources and services, such as organization information, on-line training, e-mail, search engines.

Media Server - A server designed to provide streaming media for purposes such as web casting, video conferencing, distance learning, video surveillance, Internet Radio/TV, entertainment, and forms of streaming rich multimedia content over IP networks.

4.4.5   Business Support

Commercial off the shelf (COTS) technologies which aid in the development of systems that support business objectives, mission, overall operations (i.e. Geographic Information Systems (GIS), Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems).

Business Support - Commercial off the shelf (COTS) technologies which aid in the development of systems that support business objectives, mission, overall operations.

4.4.6   Desktop Productivity

Technology that supports a varied range of desktop/office tasks including the development and maintenance of spreadsheets, presentations, word processing, planning, publishing, and/or reporting documents.

Electronic Messaging - Client-based technology that facilitates the exchange of computer-stored messages by telecommunication.

Collaboration - Technology that facilitate real-time interactions (i.e. white boarding, electronic meetings, etc…).

Word Processing - Office automation technology that facilitates the creation of documents through computerized text editing, formatting, storing, and printing.

Accounting - Technology that provides electronic versions of paper-based spreadsheets that make it easier to manipulate, process, and view data.

Planning/ Scheduling - Technology that facilitates the formulation of a scheme or program for the accomplishment, enactment, or attainment of a specific activity or set of activities.

Reporting - Technology used to extract data from a data store and process it into useful information.

Publishing/Viewing - Technology that produces and displays quality documents combining output from work processors with design, graphics, and special layout features.

Design Tools - Technology that facilitates the development of diagrams that document and organize complex ideas, processes, and systems.

Multimedia - Technology that facilitates the development and playing of audio and videos.

Utility - Technology that is very specialized and relatively limited in capability (i.e. WinZip, cd burners, etc…).

4.4.7   Hardware Platform

Technology that performs logic operations and manages data movement that is designed to work with a particular operating system or a processor's set of instructions.

Mainframe - A large computer with massive memory and extremely rapid processing power. This computer is typically used for very large applications that handle massive amounts of data or many complicated processes.

Server - A computer which is designed to be accessed by many other computers. Servers can be attached to local area networks and/or be hooked up to the Internet. With the proper software and connections, servers can control the distribution of email, store World Wide Web documents, and provide access to files that are shared by many users.

Laptop Computer - A portable personal computer of a size suitable to rest comfortably on one's legs. A laptop is smaller than a "luggable" (portable, but not comfortably) but bigger than a "palmtop" (easily carried in one hand or a shirt pocket).

Desktop Computer - A personal computer small enough to fit conveniently in an individual workspace.

4.4.8   Operating System

Technology that is loaded onto a computer by a boot program, to manage all the other programs in a computer.

Mainframe OS - Software that manages and controls the activities of a mainframe.

Server OS - Software that manages and controls the activities of a server.

Laptop Computer OS - Software that manages and controls the activities of a laptop computer.

Desktop Computer OS - Software that manages and controls the activities of a desktop.

Mobile Device OS - Software that manages and controls the activities of a mobile device.

4.5   Application Development Domain

The application development domain defines the technical elements to build systems and/or programs with functionality that can be interfaced, extended, and deployed.

Figure 7: TRM Application Development Domain
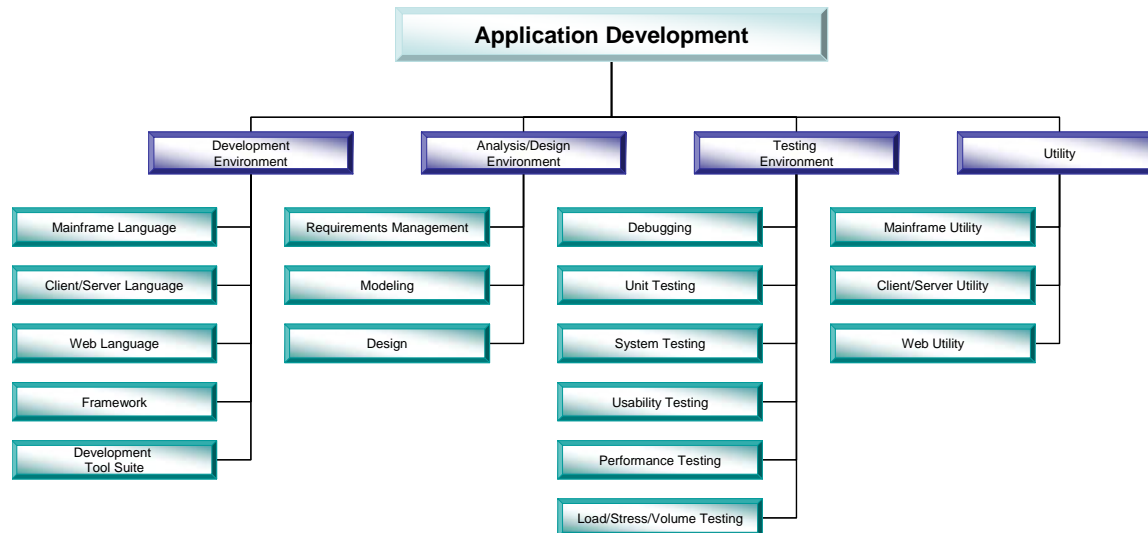
4.5.1   Development Environment

The set of programming languages and tools used to create a program or software product. The domain can also describe the physical environment that houses programming languages and tools.

Mainframe Language - A formal language used to write instructions that can be translated into machine language and then executed by a mainframe computer.

Client/Server Language - A formal language used to write instructions that can be translated into machine language and then executed in a local distributed environment.

Web Language - A formal language used to write instructions that can be translated into machine language and then executed using a browser.

Framework - A collection of programming support items used to simplify and accelerate the development of an application.

Development Tool Suite - A programming development environment used for writing applications. It consists of a runtime environment as well as the tools and programming that developers need to compile, debug and run applications they develop.

4.5.2   Analysis / Design Environment

Provides a common platform which system developers can use to define a set of standardized and well-defined design methods, languages, and system evaluation criteria.

Requirements Management - Technology that manages the organization, control, and requirements tracking process as well as changes to the originally specified requirements for a new system, project or product.

Modeling - Technology that supports the process of representing entities, data, business logic, and capabilities as aid to software engineering efforts.

Design - Supports the phase within the overall application development process which studies, incorporates and connects hardware/ software engineering, programming, human factors research, and ergonomic nodes of an intended application.

4.5.3   Testing Environment

Technical environment which includes facility resources as well as the hardware and software necessary to support test development and execution.

Debugging - Technology used to locate and fix errors in computer program code.

Unit Testing - Technology that supports assessing modules of code to determine if it performs the desired actions.

System Testing - Technology used to confirm the system (complete collection of code modules) perform as desired on the platform on which it will be deployed.

Usability Testing - Supports the testing technique that ensures the intended users of a system can carry out the intended tasks efficiently, effectively and satisfactorily with few or no issues/ defects.

Performance Testing - Helps assess production readiness by exposing issues/ defects that would otherwise impact application/ system scalability and usability.

Load/Stress/Volume Testing - Supports testing of a system's operation and performance before it goes into production. Generally, this type of testing simulates a high number of concurrent users, high data transfer loads, and realistic user behavior to ensure maximum efficiency prior to going live.

4.5.4   Utility

Technology that provides support of various system processes. A utility can enhance functionality by performing specific tasks related to system resource management.

Mainframe Utility - Technology that performs a specific task(s) to support the development of mainframe programs.

Client/Server Utility - Technology that performs a specific task(s) to support the development of distributed environment programs.

Web Utility - Technology that performs a specific task(s) to support the development of programs executed using a browser.

4.6 Enterprise Management Domain

The management domain contains the standards for the monitoring, controlling, tracking and auditing the State's technologies to ensure consistent performance and delivery of service.

Figure 8: TRM Enterprise Management Domain
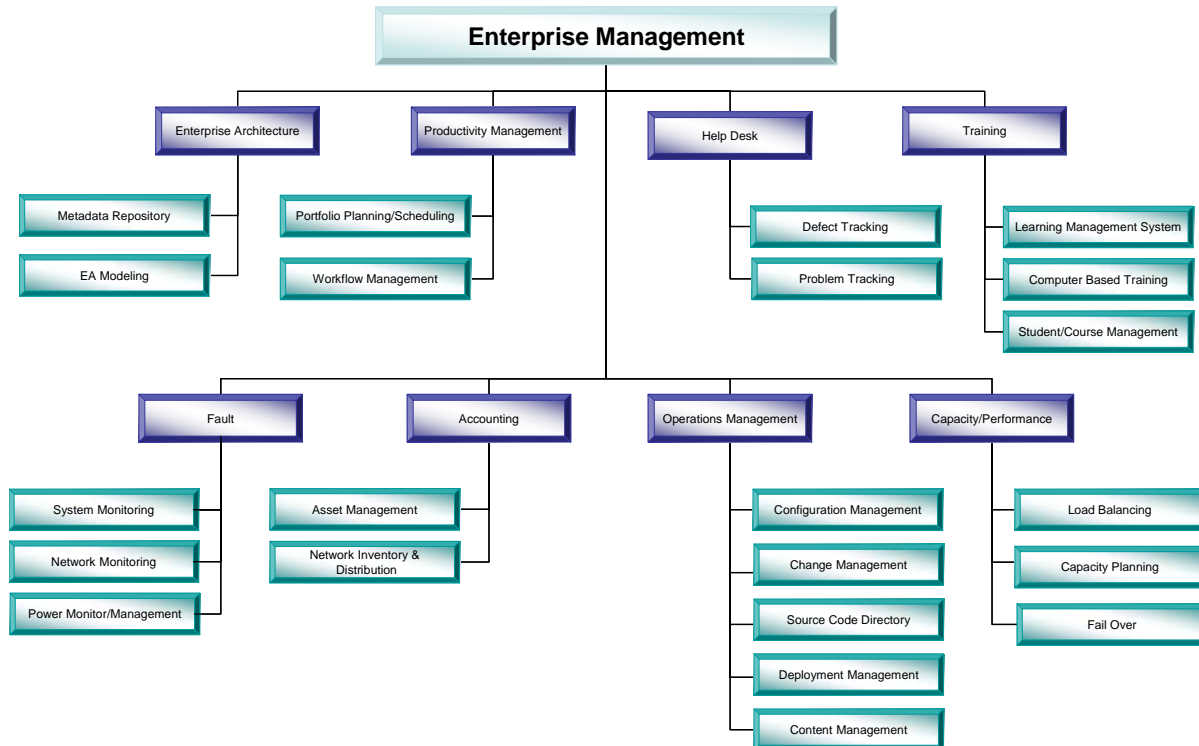
4.6.1 Enterprise Architecture

Analyzes, optimizes, and maintains an enterprise-wide portfolio of business strategies, organizational structures, business processes / tasks, data flows, applications, and technology infrastructure.

Metadata Repository - Technology that stores and manages definitions and/or descriptions of data and provides a single, secure, and standard method for supplying it to end users.

EA Modeling - Technology that supports the process of representing enterprise data to aid in strategic decision making.

4.6.2 Productivity Management

Technology that monitors, analyzes, and provides data on enterprise personnel, system, and facility performance against established objectives.

Portfolio Planning/ Scheduling - Technology that provides a structured approach to evaluating, selecting, prioritizing, and monitoring projects.

Workflow Management - Technology used to design and monitor automated business processes.

4.6.3   Fault

A fault management system assures that in the event that a component fails, a backup component or procedure can immediately take its place with no loss of service.

System Monitoring - Technology that monitors the operational status of an organization's systems.

Networking Monitoring - Technology that checks the computers, systems, and services that comprise a network. The output of this technology allows a network administrator to analyze and isolate network issues quickly.

Power Monitor/Management - Technology that monitors an organization's use of energy including power quantities, power quality, location(s) of major loads, power type, and, most importantly, cost of power/ energy.

4.6.4   Accounting

Technology associated with keeping track of IT assets.

Asset Management - Technology that supports the process whereby a large organization collects and maintains a comprehensive list desktop and server hardware and software it owns. This data is used in connection with the financial aspects of ownership such as calculating the total cost of ownership, depreciation, licensing, maintenance, and insurance.

Network Inventory & Distribution - Technology that supports the overall management of enterprise networks including software and hardware configuration, software licenses, and license reports.

4.6.5   Operations Management

Technology that monitors the personnel, processes and technology which support the delivery of service(s).

Change Management - Technology designed to manage distributed software applications from development to deployment. May use a client-server and agent based architecture to provide version, build and release management.

Configuration Management - Technology that supports a systematic process of recording and updating software, system, enterprise documentation.

Source Code Directory - Technology that provides a common repository for code objects and scripts that allows sharing and re-use of code by multiple developers.

Deployment Management - Technology designed to manage distributed software applications from a standpoint of version, build and release management.

Content Management - Technology that manages the creation, modification, and removal of content from a web site and/or private intranet site.

4.6.6   Capacity/Performance

Technology that uses capacity planning tools/ utilities to manage enterprise performance.

Load Balancing - Technology that divides the amount of work that a computer has to do between two or more computers so that more work gets done in the same amount of time and, in general, all users get served faster.

Capacity Planning - Technology that supports the forward-looking activities associated with monitoring the effective resource capacity of an organization.

Failover - Technology that provides a backup operational mode in which the functions of a system component (such as a processor, server, network, or database, for example) are assumed by secondary system components when the primary component becomes unavailable through either failure or scheduled down time.

4.6.7   Help Desk

Technology that tracks reported system problems. This technology is also used to monitor and log solutions offered by the help desk.

Defect Tracking - Technology that supports the process of monitoring, notifying, and resolving bugs in software code.

Problem Tracking - Technology that supports an organization's internal queries and operational problems for IT related issues. Includes hardware and software support, logging of problems, and dispatch of service technicians/ parts.

4.6.8   Training

Technology that supports and manages professional development offerings, such as classroom training, on-the-job training, career development programs, or developmental assignments.

Learning Management System - Technology used to plan, implement, and assess a specific learning process. Typically, a learning management system provides an instructor with a way to create and deliver content, monitor student participation, and assess student performance. A learning management system may also provide students with the ability to use interactive features such as threaded discussions, video conferencing, and discussion forums.

Computer Based Training (CBT) - Technology used to develop courses that can be completed via computer.

Student / Course Management - Technology designed to help educators create and administer a curriculum.

4.7 Security Domain

The security domain contains the technology components that protect the availability, confidentiality and integrity of IT assets across the State.

Figure 9: TRM Security Domain
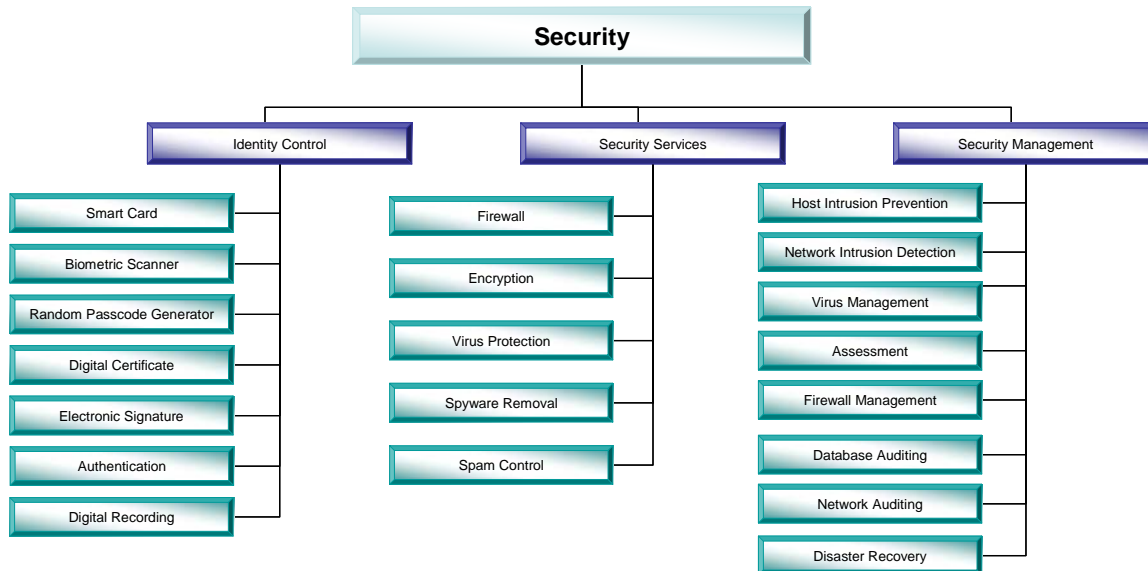
4.7.1 Identity Control

Technology that manages and oversees user access to enterprise systems, networks, and facilities.

Smart Card - A plastic card about the size of a credit card, with an embedded microchip that can be loaded with data, used for telephone calling, electronic cash payments, and other applications, and then periodically refreshed for additional use.

Biometric Scanner - A device that uses a person's physical characteristics to authenticate the user's identity.

Random Passcode Generators - An authentication mechanism, usually the size of a pocket calculator, that creates a unique value used to gain access to a secured resource. The unique value is based on a device-specific secret key.

Digital Certificate - A secure electronic identity, issued by a Certification Authority, that certifies the identity of the holder. It typically contains a user's name, public key, and related information.

Electronic Signature - Technology used to authenticate the identity of the sender of a message or the signer of a document, and possibly to ensure that the original content of the message or document that has been sent is unchanged.

Authentication - Technology that positively verifies the identity of a user, device, or other entity in a computer system, often as a prerequisite to allowing access to resources in a system. The most common form of authentication is user name and password, although this also provides the

lowest level of security. VPNs use digital certificates and digital signatures to more accurately identify the user.

Digital Recording - Technology that captures video, voice and/or photographs used for surveillance or identification.

4.7.2   Security Services

Services that protect data against unauthorized access, use, disclosure, disruption, modification or destruction.

Firewall - Technology located at a network gateway server, that protects the resources of a private network from users from other networks.

Encryption - Technology used to scramble or encode data to prevent unauthorized users from reading or tampering with the data. Only individuals with access to a password or key can decrypt and use the data. The data can include messages, files, folders, or disks.

Virus Protection - Technology that detects and quarantines or deletes computer viruses, either via a scheduled scan or real-time monitoring of the system.

Spyware Removal - Technology that facilitates the process of identifying and eliminating spyware. On the Internet, spyware is programming put in a user's computer to secretly gather and relay information about the user to advertisers or other interested parties. Spyware can get in a computer as a software virus or as the result of installing a new program.

Spam Control - Software/ hardware that manages the receipt and submittal of unsolicited email otherwise known as spam. Spam is a form of bulk mail, often sent to individuals on a list obtained from a spambot or to individuals on a list obtained by companies that specialize in creating e-mail distribution lists. To the receiver, it usually seems like junk e-mail.

4.7.3   Security Management

Policies and procedures that protect data against unauthorized access, use, disclosure, disruption, modification or destruction.

Host Intrusion Prevention - Individual hosts or devices on the network that monitor the inbound and outbound packets from the device. This technology inhibits access by unwanted parties and/or alerts the user or administrator when suspicious activity is detected.

Network Intrusion Detection - Technology that monitors traffic to and from all devices on the network to detect and/or prevent anomalous, inappropriate, or other unauthorized data transmission occurring on a network.

Virus Management - Technology that monitors and responds to computer virus outbreaks in the enterprise. It also keeps virus software updated with latest virus definitions.

Assessment - Evaluates enterprise information system security by attempting to discover any security vulnerabilities.

Firewall Management - Technology that allows the administration of firewalls (i.e. monitoring of logs, assessment of status, changing of configuration, etc...).

Database Auditing - Technology that evaluates/archives historical security information relevant to a database's physical configuration, environment, software, information handling processes, and user practices.

Network Auditing - Technology that evaluates/archives historical security information relevant to a network's physical configuration, environment, software, information handling processes, and user practices.

Disaster Recovery - Technology that facilitates the restoration of an organization to normal working conditions after a catastrophic event.

APPENDIX A   ACRONYM

ADC	Analog-to-Digital Converter
ASCII	American Standard Code for Information Interchange
CBT	Computer Based Training
CCD	Charge Coupled Device
CD ROM	Compact Disk Read Only Memory
COTS	Commercial off the Shelf
CRM	Customer Relationship Management
CRT	Cathode Ray Tube
EA	Enterprise Architecture
ERP	Enterprise Resource Planning
FEA	Federal Enterprise Architecture
FEAPMO	Federal Enterprise Architecture Program Management Office
FEATRM	Federal Enterprise Architecture Technical Reference Model
GIS	Geographic Information Systems
GPS	Global Positioning System
HTTP	HyperText Transfer Protocol
IP	Internet Protocol
IT	Information Technology
ITOC	Information Technology Oversight Commission
LAN	Local Area Network
MAN	Metropolitan Area Network
NAS	Network Attached Storage
NASCIO	National Association of State Chief Information Officers

OMB	Office of Management & Budget
OSI	Open Systems Interconnection
PC	Personal Computer
PCI	Peripheral Component Interconnect
POS	Point-of-Sale
RFP	Request for Proposal
SAN	Storage Area Network
SMDS	Switched Multimegabit Data Service
TCIP	Transit Communications Interface Protocols
TRM	Technical Reference Model
TTY	Teletypewriter
VPN	Virtual Private Network
WAN	Wide Area Network
XML	Extensible Markup Language